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## **The progression of vulnerability. A multi-scalar perspective on disasters, the case of Chaitén in Chile**

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### Abstract

This work discusses single-scale studies on disaster risk and vulnerability by exploring the progression of vulnerability –based on the Pressure and Release Model (Par model)– as a multi-scalar phenomenon. Disaster and vulnerability studies are often conceived within single-scales ideas –e.g. urban, local, regional or national–, however studies tend to neglect the geographical complexity of socio-economic and political processes involved in the production of vulnerability and risk at different scales. Thus, recent findings on scale’s studies, that is, scales as a social constructed process, may contribute to better understand vulnerability, disasters and risk as social construction as well. Hence, the case of Chaitén –a remote Volcano eruption’s disaster in southern Chile in 2008– is devised in order to illustrate how specific multi-scalar processes, such as institutional forms for disaster risk reduction or disaster risk management are unfolded from major to minor geographical scales. By the end, this study seeks to discuss that although hazards, vulnerability and risk are often evident at minor geographical scales –i.g. urban and local–, the causation of disasters and risk production should not be considered as a single-scale phenomenon but as multi-scalar ones.

Keywords: Disasters, Vulnerability, Scales

## **1. DISASTERS AS MULTI-SCALAR SOCIAL CONSTRUCTIONS**

The idea that disaster risk and vulnerability may be progressively accumulated by

socio-economic and political forces within minor geographical areas –i.g. urban and local– is implicit within the analysis of the Pressure and release model (Par model) developed firstly by Blaikie et al. in 1994 and later by Wisner et al. in 2004. Par model bases on the pseudo-equation ‘Disaster-Risk equals Hazards multiplied by Vulnerability’ –i.g.  $DR = H \times V$ – to explain vulnerability and its progression as a crucial element in the causation of disasters. By assuming natural hazardous events as something that society has little control, vulnerability and its progression is presented on the Par model as the arena where society can really fight against disaster impacts and for disaster risk reduction. The progression of vulnerability is organised from root causes, dynamic pressures to unsafe conditions (see Figure 1).

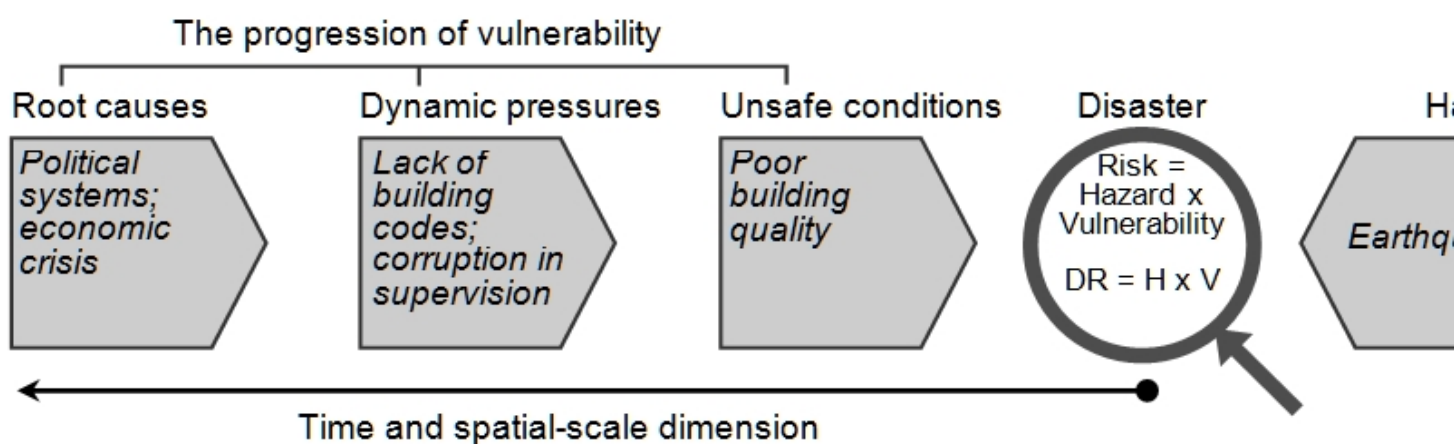


Fig. 1 – Example of the Par model to describe the progression of vulnerability.

Source: Based on Wisner et al. 2004 p.51.

Wisner et al. (2004) and Pelling (2003) have theorised that the ‘root causes’ of disasters may be geographically disperse and temporally distant from the affected area. Root causes may be understood as “an interrelated set of widespread and general processes within a society and the world economy” (Wisner et al., 2004, p.52); examples may include political regimes or economic crises, among others. On the other hand, root causes may trigger dynamic pressures such as lack of prevention and preparedness. Likewise, dynamic pressures may generate particular unsafe conditions such as people living in hazardous locations or with poor building quality.

Thus, although hazards are also very important for the causation of disasters, hazards represent mere “triggers” of disasters and not their root causes (Ibid, 2004, p.6). Crucial circumstances such as where people live and work, their levels of preparedness, hazard protection, information, education, wealth and health are determinant in shaping the impacts of a hazardous event, nevertheless, these circumstances have nothing to do with nature as such, they are produced by social, economic and political factors. Hence, disasters are explained as socially constructed phenomenon; and vulnerability as a phenomenon governed by socio-economic and political processes. Basically, vulnerability has a determinant place in the causation of disasters due to it will define the level of impact of a hazardous event.

On the other hand, although unsafe conditions are evident at minor geographical scales (Pelling, 2003a), root causes and dynamic pressures are nested at major scales both temporal and spatial. From root causes to unsafe conditions, vulnerability progresses at different spatial levels depending on the characteristics and circumstances of particular socio-economic and political processes involved in its progression. While corruption in the construction sector may cause poor building quality at the local scale, for example, corruption may be preceded by economic crises or negative political circumstances which, in turn, are nested at national, regional or even global scale.

At this point, the multi-scalar social construction of disasters seems not to be discussed, however, why have vulnerability and risk studies steadily focused on single-scales? or what are the potentials and limits of multi-scalar perspectives for disaster studies?

## **2. DISASTER AND VULNERABILITY ASSESSMENTS NEGLECTING SCALES**

The understanding of disasters and its risk has gone through at least three important phases. Disaster as “acts of God” was the first of these, and its risk as a inherent fear to God’s fury. Then, disaster as “acts of Nature” and its risk as its inseparable probability of occurrence, therefore, only knowing “when and how” of natural events people will be safe. And finally, disaster as “acts of Woman and Men” and its risk as an intrinsic consequence of human development, political decisions and socio-economic circumstances (Boano and Lund, 2011, p.59; Wijkman and Timberlake, 1984). During the last two phases, around 1950s and 2000s, research on disasters, risk and vulnerability started to be systematically carried out. Boano and Lund (2011) have highlighted the transition from techno-centric perspectives nested into ideas that disaster can be reduced by improving our knowledge about natural events and promoting large-scale mitigatory infrastructures, to a constructionist approach in which social scientists have focused more on the social causes of disasters –i.g. vulnerability–. This shift materialised during 1980s (Quarantelli, 1987) after the evident failure of techno-centric approaches on explaining the increasing number of disasters (Pelling, 2003), even when techno-centric

approaches represented the “dominant view” of the time (Hewitt, 1983, p.3). According to Quarantelli (1998), the failure of techno-centric approaches on addressing the problematic of disasters lies on misunderstanding the multi-dimensional complexity of disasters. In other words, disasters studies have neglected the complexity of socio-economic and political processes which participate in the production of risk and the progression of vulnerability. Maybe for that reason both techno-centric and social science approaches have been subordinated to the analysis of fixed geographical scales or spatial units: urban risk, regional disaster risk management, national or global risk assessments. As implicitly the Par model suggests, this complexity need to be unpacked.

On a political and governance level in the context of Chile, identification of ‘prone disaster areas’ started to be required for master plan preparation purposes since 1976 (LGUC Act, Section 60/1976), however, it was not until 1992 that ‘risk assessments’ were imposed by law (OGUC Act, Section DS47/1992). Currently, an “identification of risk areas” (ibid) is required to prepare any master plan. Such ‘identifications’ are indeed ‘risk assessment’ commissioned to private engineering contractors or consulting companies. In order to help to identify risk areas, law (OGUC Act, Section DS09/2011) guides risk assessments based on the following principles:

- Flood or potential flood areas due, inter alia, to the proximity of lakes, rivers, streams, creeks, unchannelised streams, ground water or wetlands.
- Avalanche-prone areas, boulders, landslides or accentuated erosion.
- Hazardous areas to be affected by volcanic activity, lava flows or faults.
- Hazardous areas generated by human activity or intervention

As mentioned above, although risk emerges as result of combining hazards and vulnerability, mentioned principles reveal that, on a policy framework perspective, risk is only understood as the identification of hazards and disaster-prone areas. In other words, the so-called ‘risk assessments’ neglect almost completely vulnerability. Moreover, even if it is only in technical terms, Chilean policy framework exclusively promotes ‘risk assessments’ at urban/rural level (see Table 1), neglecting as consequence the analysis on other spatial-scales or multi-scales such as regional and national.

Tab. I – Current Policy Framework in Chile: Authority of Spatial Planning Instruments (IPT) on identify risk areas

IPT

Urban area

Rural area

Regional Plan of Urban Development

-

-

Inter-municipal or Metropolitan Regulatory Plan

X

X

Municipal Regulatory Plan

X

-

Urban Boundary

-

-

Sectional Plan

-

-

Source: Based on Gimenez Celis (2012).

The neglecting of vulnerability assessments on risk analysis partly reflects the way in which risk assessments disregard the multi-scalar construction of disasters. Hence, the socio-economic and political processes that shape vulnerability, and therefore disasters and disaster risk, are underestimated. This paper proposes to discuss these socio-economic and political processes as drivers of vulnerability, risk and disaster production under the light of a geographical multi-scalar approach.

## **2.1 Geographic complexity of socio-economic and political processes**

The viewpoint in which root causes of disasters include socio-economic and political processes is grounded on a political economy perspective. Cohen's phrase "disasters occur in a political space" (2008, p.795) refers to the idea that the socio-economic and political dimensions of

society; governance, policies, poverty, employment, wealth, health, among many others, are intrinsically responsible of the causation of disasters. As argued previously, hazards may trigger disasters but vulnerability –including root causes, dynamic pressures and unsafe conditions– ultimately shapes disaster and risk. Macro forces such as political-economy regimes or globalisation are jointed to space. For instance, globalisation needs the construction of infrastructure for transport and communication in order to support the continuous accelerated circulation of goods, commodities and people (Brenner, 1998; 1999; 2009). Airports, seaports, highways and railways are critical for supporting globalisation as a ‘global’ process (Castells, 1996; Sassen, 1991; 2006). Nevertheless, although these infrastructures may have a tremendous impact at regional or national level, they take place primarily at city level. The relationship of the globalisation process with space, as also occur with other socio-economic and political processes, cannot be disassociated due to social processes need space to delineate its scale; local, urban, metropolitan, regional, national, international and global (Swyngedouw, 1992). For Neil Smith (1993, p.101), “The construction of scale is not simply a spatial solidification or materialisation of contested social forces and processes [...] Scale is an active progenitor of specific social processes [...] Scale demarcates the sites of social contest, the object as well as the resolution of contest”. Thus, the construction of space by social forces and processes invariably produces spatial scales as the resolution over control over space:

“[S]ocial struggles, formally or informally codified, are also necessarily territorially based. In fact, these struggles are essentially over the content and boundaries of specific territorial forms of coherence (Lefebvre 1974). The scale of territorial coherence is itself the outcome of a struggle between ‘control over place’, that is, over the production, realisation and distribution of surplus, and ‘control over space’, that is, over the conditions of the struggle over the production, realisation and distribution of surplus (Smith 1989). [...] In short, territory as a social relationship is a spatial moment in the historical unfolding of class relationships, while scale of territory defines the spatial moment of control in the struggle in and over space.”

(Swyngedouw, 1992, pp.59-60)

However, this drives other questions such as; how are particular socio-economic and political processes spatially or geographically organised? or how is the progression of vulnerability spatially or geographically scaled? These questions cannot be fully addressed in this work but could be better understood by exploring contemporary notions of scales.

### **3. UNDERSTANDING CONTEMPORARY NOTIONS OF GEOGRAPHIC SCALE**

The spatio-temporal gap between root causes and the disaster moment does not make easy to empirically connect macro socio-economic and political processes to unsafe conditions (Williams, 2011). This study argues that this complexity may be overcome by approaching contemporary notions of geographical scales into this particular vulnerability approach.

Traditionally, mostly by geographers and physicists, geographical scale had been conceived as fixed spatial units where social, economic, political and even environmental dynamics unfold. Geographical scales were understood just “as a fixed, bounded, self-enclosed and pre-given [spatial] containers” (Brenner, 2001, p.592). Edward W. Soja (1989, p.149) noted that the question of scale and its social production remained “understudied” and was “generally subordinated to analyses of spatial practices positioned within fixed geographical scales: the local, the urban, the regional, the national, and/or the global” (Brenner, 1998, p.460). This traditional view failed to explain contemporary phenomena such as the massive geographical changes entailed by globalisation; the global labour market restructuring in 1970s (Castells, 1989; Sassen, 1991), the crisis of the nation-state territoriality (Appadurai, 1996; Liubimau, 2011) or the reterritorialisation process of cities and states during 1990s and 2000s (Brenner, 1999). Such transformations demonstrated that certain social phenomena not only unfold at one single spatial scale –e.g. urban ‘or’ global– but at multiple geographical scale –urban, regional ‘and’ global– or what Brenner (1998, p.463) refers as a “multi-scalar” processes. Accordingly, geographical scales should not be grasped individually but as result of multi-scalar processes and therefore as interconnected and interdependent spatial entities:

“Scales can only be grasped relationally. Scales cannot be construed adequately as fixed units within a system of nested territorial containers defined by absolute geographic size (a “Russian dolls” model of scale). The institutional configuration, function(s), histories, and dynamics of any one geographical scale can only be grasped relationally, in terms of its upwards, downwards, and transversal links to other geographical scales... [...] From this point of view, it is analytically imprecise to speak of scale in singular terms—as, for instance, in discourses about “the” urban, “the” regional, “the” national, or “the” global. Such substantialist formulations misleadingly imply that individual scales contain a coherence in and of themselves, and thus bypass the essential task of analysing their relational co-constitution in and through multi-scalar structuration processes.”

(Brenner, 2009, p.72)

Doreen Massey’s famous (1994, p.63) question, “In what sense are ‘regional’ problems regional problems?” and the well-known concept “Glocalization” developed by Erik Swyngedouw (1992) can be usefully applied to illustrate this idea.



While these perspectives entailed a radical understanding of geographical scales, the scale question needed to be reconsidered in other senses. For critical thinkers such as Brenner (1998; 1999; 2001; 2009), Swyngedouw (1992; 2000), Smith (1984; 1993; 2008), and Knox (1995), geographical scales were undoubtedly “socially constructed”. Social processes need space to delineate its scale; local, urban, regional, national or global, thus the geographical scale of social struggles and processes vary over time depending of the extension and contraction of the struggle itself. As put by Swyngedouw (1992, p.60), “Geographical scale is both the realm and the outcome of the social struggle over control over space”. Hence, the social production of scale is subordinated to socio-political contestation and therefore is “historically changeable” (Brenner, 2001, p.599). See, for instance, how geo-political boundaries have been transformed throughout human history, or how global or international scales have contracted since the rise of ever faster transportation networks and communication technologies (Castells, 1996).

Brenner argues that geographical scales may be better understood as differentiated spaces often by size but, more importantly, scales results from “vertical differentiation” (Brenner, 2009, p.71) –its “*differentia specifica*” from other socio-spatial concepts–. Thus, what make sense to one geographical scale category –e.g. urban– is its relations with other categories –e.g. regional, national, global, etc.–. In other words, the socio-spatial analysis of either urban, regional or national social phenomena should not be dissociated from a scalar differentiation analysis –“the hierarchical ordering or spatial hierarchisation of social formations” (Ibidem)–. The interscalar relationship between those classical spatial-scale categories –the global, the national, the regional and the urban– should always be analytically considered.

Brenner (2009) points out that social sciences have tended to divide socio-spatial processes according to their distinctive foci; urban studies, regional studies, comparative politics, international relations, and so forth, “which tend to obstruct efforts to explore the dynamics of interscalar relations and transformations” (Ibid, p.69). Finally, in this sense, this study is an attempt to consider those ‘interscalar relations’ in the progression of vulnerability.

In sum, this work argues that crucial elements of the socio-spatial analysis of geographical scales such as ‘historical changes’ and ‘hierarchical differentiations’ should be always incorporated into the analysis of vulnerability progression when specific socio-economic and political processes are involved in.

#### **4. CHAITEN AND UNFORESEEN MULTI-SCALAR PROCESSES CONTRIBUTING TO INCREASE VULNERABILITY**

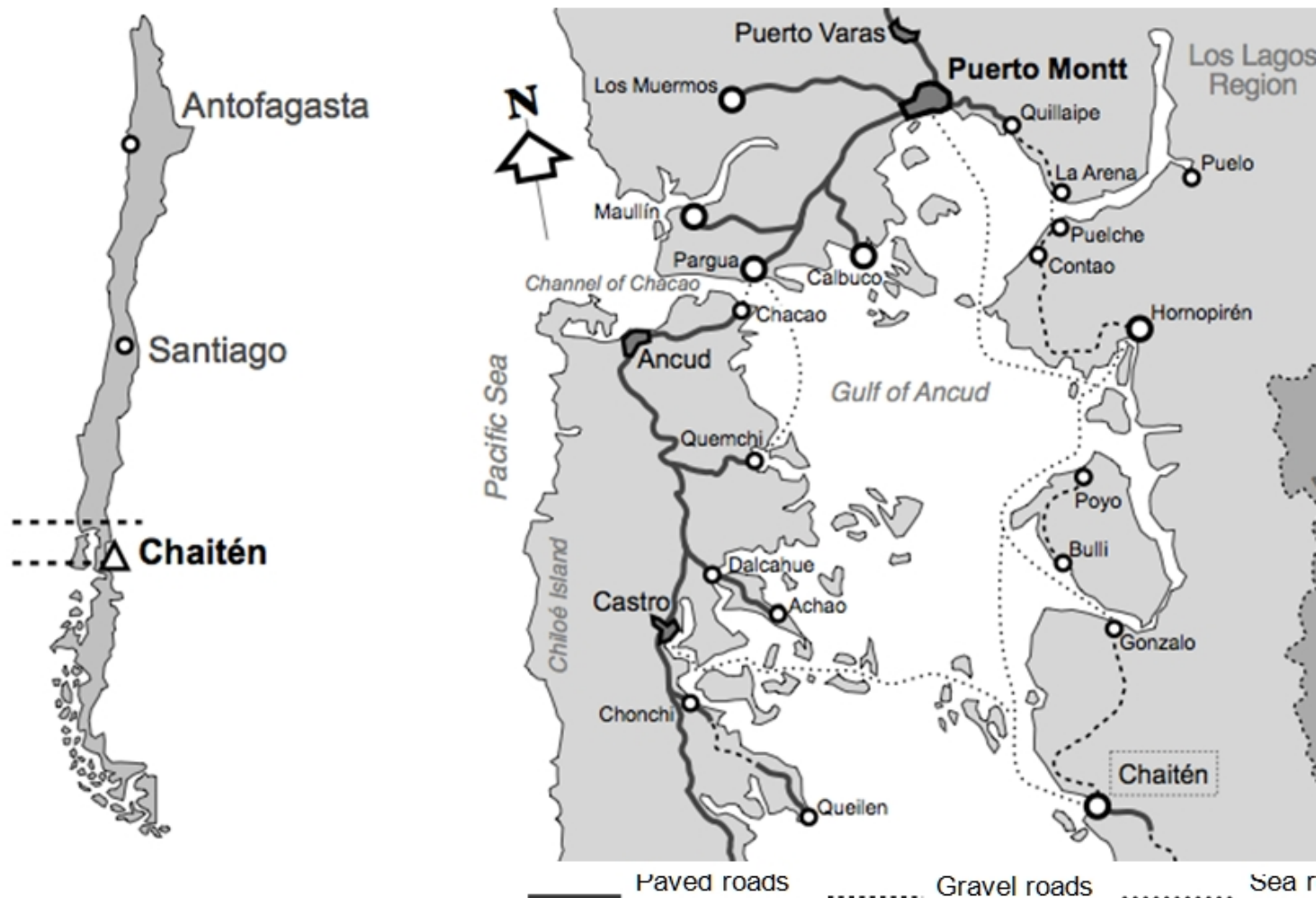
In May 2008, the Chaitén volcano, located in Los Lagos region (Llr) at southern Chile, erupted and caused the evacuation and subsequent displacement of the Chaitén's entire population, more than 7000 inhabitants, including public officials and emergency personnel (De la Barrera et al.

, 2011). In the first day, Chaitén's inhabitants were evacuated mainly to the neighbouring cities of Puerto Montt and Castro (see Figure 2). Ten days after the evacuation, the explosion of the volcano's dome caused

lahars

and floods that left Chaitén almost uninhabitable (Lara, 2009). Economic losses were estimated in Us\$12 millions, only by insured public buildings, and other Us\$36 millions were directed to social support for displaced people (Ibid). Although no fatalities resulted from the eruption, this was considered a disaster by Government officials and media (Barrionuevo, 2008; Ivelic and Arrasate, 2012) due to its high social and economic costs. Likewise, the inefficiency of authorities in delivering a reconstruction plan in the next five years was the threshold of Chaitén's people calamities (Sáez, 2009).

After one year since the eruption, three reports (Moreno and Lara, 2008; Moreno et al., 2008; Sernageomin, 2009) commissioned by the Chilean Government determined that the historic location of Chaitén is highly prone to new eruptions and seismic activities. As a result of the foregoing, in January 2009 the Government announced (Muñoz, 2009) that there will be no reconstruction of Chaitén and there will be no further investment of any kind in the current location. Nevertheless, Government asserted that alternatives plans based on the displacement of Chaitén to safer areas were considered. Two years after the eruption, in 2010, Santa Barbara was chosen as location of the New Chaitén (Ramirez, 2010). However, in February the same year, a massive earthquake struck the southern-central area of the country killing around 500 people, affecting other two million, and producing more than Us\$30 billions in losses (MarketWatch, 2010). Accordingly, plans for the relocation of the New Chaitén were stopped (Ramirez, 2010).



#### 4.1 Institutional forms and their (in)actions

One of the argument to support the idea that the progression of vulnerability and the production of disaster risk as a multi-scalar processes lies on how institutional forms for Disaster risk management (Drm) and policies and initiatives for Disaster risk reduction (Drr) are geographically and hierarchically –thus scalar– organised. In this study, more than 50 authorities and related academics and experts were interviewed at different geographical level of organisation: national, regional (Los lagos region were Chaitén is embedded) and local (Chaitén). In a preliminary analysis, it may assert that Drm or Drr ideas are not part of the authorities' discourse, either for national, regional or for local ones. The absence of these ideas within the authorities' imaginary does not mean that there are not policies or initiatives for Drm and Drr. Indeed, there are diverse policy and planning instruments (Unesco et al., 2012) which directly or indirectly promote Drm or Drr measures . Some of these instruments include: Regional plan of territorial planning (Prot) which include a complete guidelines for authorities on hazard, vulnerability and risk assessments named Guidelines on natural risk assessments for regional planning, and Municipal emergency plans (Mep) related only to the management of emergencies. However, Meps include initiatives on preparedness which may be considered within Drm or Drr measures, some includes: municipal actors coordination and identification of

safety and hazardous areas within the city. Despite these instruments, and the relatively good performance in the last 27-February earthquake (Unisdr, 2011), both experts and some authorities agree on that Chile lacks of a national or an inter-sectorial comprehensive strategy for Drr and Drr.

The lack of a national strategy for Drr or Drr have triggered uneven level of preparedness. While some municipalities are well-prepared (Unesco et al., 2012) there are others, such as Chaitén, that still lack of an updated Mep –Chaitén’s Mep was issued in 2010–. Likewise, although Prots were commissioned to regional governments in 2010, only few governments have prepared their Prot yet. Disturbingly, as national official asserts: “...probably regional government will commission Prots to private consulting companies in order to comply with the law, then governments will archive it because there is no way to enforce governments to take actions in order to reduce detected vulnerabilities and risks within Prots [...] we still must work on that, that is, in policy terms.” (anonymous interviewee Apr 2013). Thus, the way in which some institutional forms such as planning instruments, policies and laws are configured produces different effects on vulnerability and risk at different geographical levels as well as the mentioned erosion of local trust in all-levels’ authorities due to decisions taken at national level.

## **5. DISCUSSION ON THE MULTI-SCALAR PROGRESSION OF VULNERABILITY**

Eroded community trust, uneven exposition of Chaitén’s people to hazards and people’s difficulties for accessing to public services and infrastructure are local-evident expressions of vulnerability and risk. These circumstances are not constructed merely as consequence of the volcanic event in 2008 but they are rooted on decisions taken and institutional forms’ effects which are nested at other geographical scales rather than local. At this point, it seems evident that the progression of vulnerability —i.g. root causes, dynamic pressures and finally unsafe conditions– is based on socio-economic and political processes that necessarily are organised through a scalar space. In the case of Chile, institutional forms and practices for Drr or Drr, formally or informally established, are geographically and hierarchically organised in the way of the State administration does. That is, national authorities and policies provide advice and guidelines thus regional and local authorities can unfold –often inappropriately– Drr and Drr initiatives (Unesco et al., 2012).

The Par model presents a logic chain of explanation where the progression of the local-evident vulnerability is devised to explain the causation of disasters by natural events. However, this logic is embedded to and only works under the political economy perspective of national or global systems. In other words, the multi-scalar perspective of the Par model can only be supported when a local community participate of and is influenced by a larger system –e.g. national State and/or global economy–. In addition, other question arise for further analysis: if

vulnerability and risk may be understood as the result of particular socio-economic and political processes which, in turn, are geographically scaled, do vulnerability and risk play a role in the social production of specific geographical scales? In other words, it may be possible that vulnerability and risk can be influenced by geographical scales configurations and, in turn, vulnerability and risk may influence these scalar configurations.

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